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Polly Wiessner

Measuring the impact of social ties on nutritional status among the !kung San

In the past two decades, studies in human ecology have centred on the adaptive value of cultural practices, particularly with regard to nutrition (Harris, 1978; Rappaport, 1968; Vayda, 1969). Although the adaptive value of all cultural practices is a matter of debate (de Garine, 1980; Jones, 1978), there is little doubt that many of them have a major impact on diet whether it be positive or negative. However, few studies have attempted to systematically measure their effect on nutritional status, and thus they remain hypotheses of the anthropologist to be debated and cited, but ignored in

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development planning (de Garine, 1978). This situation will not change until anthropologists and nutritionists can demonstrate the effect of cultural practices and give governments a sound estimate of the cost of replacing them if they are broken down with development.

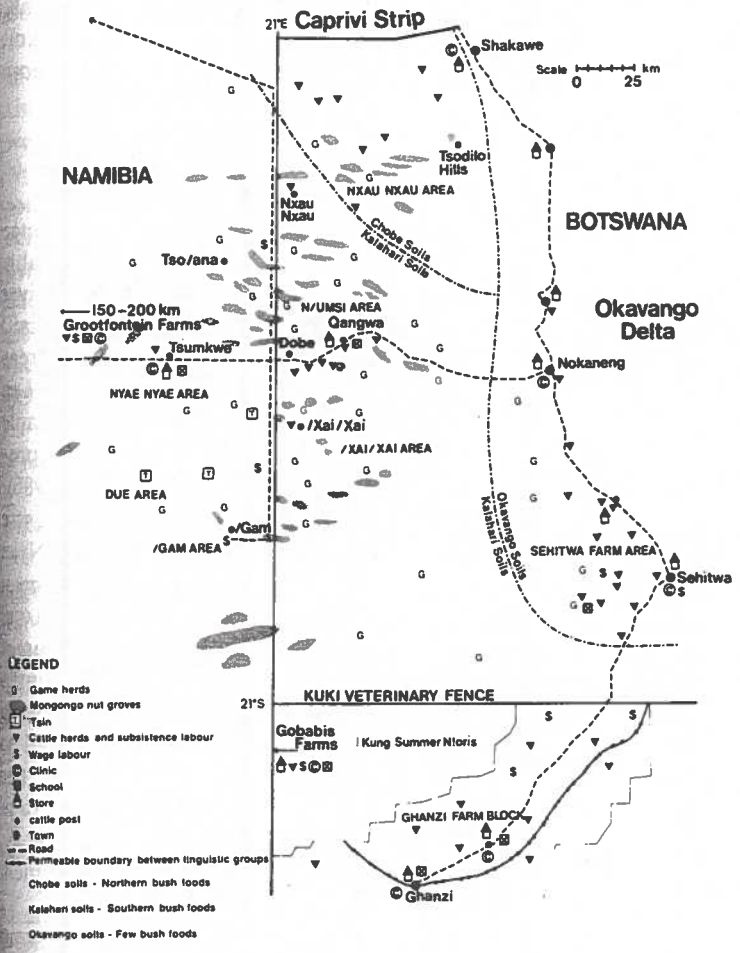
In this paper, I will take up the problem of measuring the impact of social ties on nutrition. I will do so by discussing the approach, methodology, problems, and results of a study, in which I tried to systematically investigate and quantify the local and regional social ties of the !kung San (ǯu/ōasi), and co-ordinate the results with a nutritional study carried out by Ed Wilmsen (1980) in the same area. Although the study by no means meets all of the goals suggested above, I hope to show that social relationships can be assessed in a way which allows them to be included in the research design of a nutritional study, so that their positive or negative impact can be measured.

The study discussed here was carried out from 1973-77 in conjunction with, although not as part of, Ed Wilmsen's nutritional study of the !kung at /xai/xai. It was an ethno-archaeological study, aimed at gaining a more thorough understanding of how material culture supports and symbolizes social relationships, and how specific organizational strategies are reflected in profiles of stylistic variation in artifacts over space. To do this, it was necessary: 1) to quantify all aspects of social relationships including the movement of persons and objects, and 2) to discover how the above relationships function within the society (Wiessner, 1980 b). Part of this function is to maintain food distribution links, thus it was critical to collect data in such a way that it could be linked to Wilmsen's findings. Before turning to these problems, I will give a brief summary of the ethnographic background for the !kung.

Ethnographic background

The !kung San in the study area live in the N/umsi (Dobe), /xai/xai and Nyae Nyae regions of northwest Botswana and northeast Namibia, although their ties of reciprocity link them to more distant !kung as well as San[1] of other language groups, the G/wi and the Nharo. The ties of the /xai/xai !kung, for instance, extend 150 km to the north to groups in the Nxau Nxau, Tsodilo and Shakawe areas; 200 km to the west to !kung settled on farms around Groot-

MAP 1
Distribution of resources in areas surrounding /xai/xai



fontein in Namibia; 200 km south to !kung, G/wi and Nharo settled in the Ghanzi farm area; and 150 km east into the Tsau-Sehitwa area (see Map 1). The !kung distribute themselves over the landscape in areas of landrights called *n!oresi*, with !kung inheriting one *n!ore* from their mothers, one from their fathers and obtaining permission to live in that of their spouses (Lee, 1979; Marshall, 1976; Wiessner, 1977). Each *n!ore*, an area of 300-600 sq. km. (Lee, 1979), has enough food and water to sustain one or more bands on their seasonal rounds.

Resources and environment

Resources in the Kalahari as a whole, and on the northwest fringe in particular, are highly localized in space and extremely variable from year to year (Yellen and Lee, 1976; Lee, 1979). Map 1 gives the distribution of some of the major resources in the Nxau Nxau, N/umsi, Nyae Nyae, Due, /xai/xai, G/am and Tsau-Sehitwa areas based on information provided by Biesele (1975), Yellen and Lee (1976), and Marshall (1976).[2] As can be seen in Map 1, staple resources such as the mongongo nut, which in some months provides 70-80 percent of the diet in the /xai/xai area (Wilmsen, 1980), are completely absent in other *n!ores* 50 km to the west in the centre of the Nyae Nyae area and are not a staple food for any of the Nyae Nyae !kung (Marshall, 1976). In this latter area the Tsin bean replaces the mongongo as a staple. In the N/umsi (Dobe)-/xai/xai areas, even adjacent *n!oresi* are known to specialize in resources at given times of the year, with some being known for mongongo nuts (*Ricinodendron rautanenii*), others for tsin beans (*Tylosema esculenta*), others for baobab fruits (*Adansonia digitata*), and so on, all of which are rich in protein, minerals and vitamins. The localization of resources is compounded by yearly variation in rainfall with one out of every four years being a drought year (Lee, 1979), making resources outside of a 15-20 km radius of permanent waters inaccessible for 8-9 months of the year.

Today, the presence of agriculturalists in the /xai/xai-N/umsi areas, a government settlement scheme at Tsumkwe in the Nyae Nyae area, and ranches in more distant ones has made the variation between *n!oresi* even greater, adding access to domestic foods, wage labour, schools, clinics and markets to some, while leaving others relatively unchanged. The highly localized distribution of non-traditional resources is shown in Map 1. All San in the study relied on both traditional and non-traditional foods, with by far the greatest part of their diet coming from the former. Non-traditional resources were obtained when available, but no San in the sample had yet made the switch to permanent wage labour or food production.

Lee, in his fundamental ecological work among the !kung, has shown that the Dobe !kung in July and August enjoy a high subsistence income for about 12-15 hours of hunting and gathering a week (Lee, 1969, 1979). Marshall estimates that the !kung in the Nyae Nyae area, which lacks rich mongongo groves, work somewhat longer — at least half of each week in subsistence pursuits (Marshall, 1976). Wilmsen (1979, 1980) has added a seasonal perspective to these studies and gets figures similar to Lee's for July and August, but, both from records of caloric intake and weight gains and losses, can show that from September through February, the San suffer from a shortage in calories. Truswell and Hansen (1976) report similar findings.

Reciprocity

Since the Marshalls' fieldwork with the !kung of Nyae Nyae in the 50s, almost all studies have made it clear that the !kung could not enjoy the standard of living they do without social ties which allow for widespread sharing, exchange and interband visiting. Lorna Marshall (1961, 1976) has vividly documented !kung meat sharing and gift-giving and its importance in promoting social solidarity. She also stresses the importance of visiting among the !kung:

> visiting has very important functions in !Kung life. The !Kung visit a great deal . . . They visit for many reasons, for the pleasure of seeing people they like to be with, for change of scenery, to take gifts, to receive gifts, to arrange marriages, to take news of marriages, births, and deaths, for solace in grief, and to participate in rituals [. . .] The custom of visiting helps to keep the resources of an area equally distributed. If a band's waterhole fails temporarily or its food resources are low, the members of the band visit relatives who are better off." (Marshall, 1976, pp. 180-181)

Twenty years later, Lee (1972, 1979) describes similar patterns of sharing, exchange and visiting and calls attention to the gift-giving network called *hxaro*. Because both Marshall and Lee's works are both sensitive and thorough, they provide excellent descriptions of

social ties, reciprocity, visiting. Like many ethnographies though, the description is general, illustrated with one or two specific episodes, making social factors seem intangible. However, if they cannot be investigated systematically, they are of little use for either ethno-archaeological or nutritional work.

In order to go beyond description, !kung social ties were investigated by the following procedure: 1) establishment of residences for each family in the study area by looking at their movements over the last ten years, 2) isolation of different types of reciprocal relationships and collection of quantitative data on the characteristics, distribution and functions of each, 3) collection of independent data to verify the hypothesized functions of the above relationships and frequency of use, 4) correlation of the above data with that from Wilmsen's study so that their impact on diet could be measured. The last step is now in progress. Below I will describe the methodology and results for each of these steps, and discuss which of the methods used and problems confronted are unique to the !kung, and which are relevant for similar studies in other societies.

Establishing residences

The literature on the !kung gives conflicting views on residential stability — Marshall (1976) reports that each band is a coherent entity with changes in membership taking place largely with demographic events, while Yellen and Harpending (1972) argue that the !kung wander almost randomly in space. Needless to say, if distribution of social ties is to be described, it is first necessary to establish whether or not !kung can be placed in one or two specific residences.

To tackle this problem, Richard Lee generously lent me his census data from 1963 and 1967-69, which I worked up before going to the field in 1973. During the first few months of fieldwork, data were collected on group composition, noting all changes since 1969. When added to Lee's data, the data gave a ten year perspective on changes in group membership. This information was supplemented by asking each !kung about his inherited areas of landrights and comparing the results with the residence data.

The ten year perspective on !kung group composition revealed that, although frequent extended visiting makes band membership

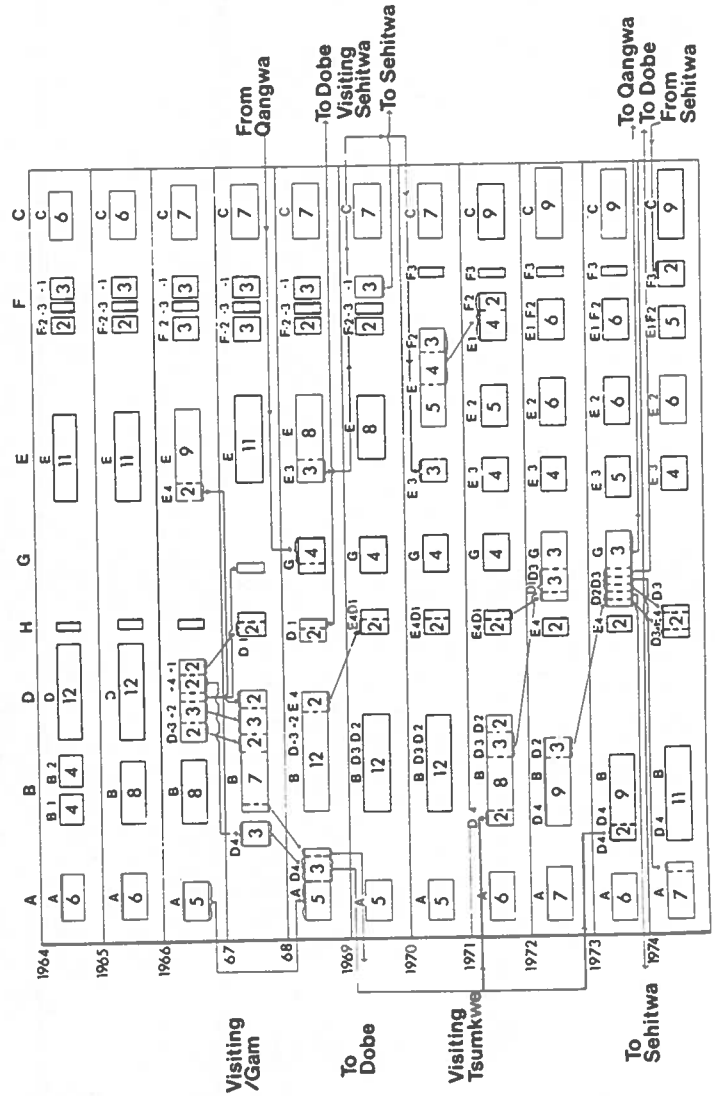


FIGURE 1
Changes in group structure at /xai/xai from 1964-1974

appear unstable to the short term observer, that aside from changes brought about by demographic events, camp and particularly areal membership is rather stable. The changes in composition of the six camps at /xai/xai are given in Figure 1. Increases or decreases in number of households in a camp from year to year when no movements are indicated are due to demographic events. Between 1964 and 1974, three of the six camps, A, B and C, remained essentially stable in membership, although they were joined by members of other camps which dissolved. Camp D, which had been stable for years, split upon the death of three central members in one year and divided into segments all of which joined neighbouring bands, except for two families which left the area. After its dissolution, one member formed a new camp by assembling old members and bringing in his relatives from the north who were frequent visitors to /xai/xai. Camp E split into three segments when the children of its core members matured and married, causing the camp to be too large, and camp F, a segmented camp attached to a Herero household, split when segment F-1 emigrated to the Sehitwa area seeking wage labour.

Most of the changes in group composition then, can be seen as attempts of cores of close relatives to maintain a viable camp in the face of conflict or demographic events which either increase or decrease its membership. When a camp dissolves, most persons at /xai/xai have close relatives in one or more other camps whom they can join, although frequently they change camps once or twice until they find a suitable new residence.

These changes, however, do not greatly affect a person's possibilities to exploit his own area of landrights, because each person living at /xai/xai has rights to exploit the resources of a certain area immediately surrounding of /xai/xai, as well as an area of landrights 10-25 km out in the bush. When a camp splits and families recombine with other camps, persons can continue exploiting their own area of landrights at /xai/xai and often return to their own bush *n!ores* for several months in the summer. Thus, unless persons move out of the /xai/xai area, they continue to hunt and gather in their own area of landrights, expressing a strong feeling of attachment to this area. It is for this reason that despite changes in camp membership, the population of /xai/xai is remarkably stable. For the six bands in the /xai/xai area composed of 130 members in 1964, by 1974, excluding 8 percent of the population that had emigrated seeking wage labour, only 15 percent of the population had turned over with marriage, immigration and emigration (Wiessner, 1977, 1980 a).

Correlation of residence with inherited area of landrights revealed that, of 92 adults at /xai/xai, 52 (57 percent) of these were currently living in either their mothers' or fathers' *n!oresi* and that another 14 (15 percent) were living in an area adjacent to their own, allowing them to utilize the resources of their own area for at least part of each year. Thus, the above data do suggest that for the purpose of looking at distribution of social ties and visiting patterns, most !kung can be placed in one or in some cases two permanent residences.

Discussion

The problem of trying to pin down a residence for each family is not unique to the !kung, but will be present among most groups who do not remain sedentary to reap the benefits of investment into the land. The establishment of a residence for each family in the study area was greatly facilitated by the census data collected by Richard Lee in previous years. Otherwise, it would have been necessary to question each person about residence during each major event of his or her lifetime and try to determine degree of residential stability from this data. It might be added that obtaining a ten year perspective on changes in group composition was essential to understanding !kung mobility. Extended visits of two weeks to a year or more are such frequent events in !kung life that during the average two year period of fieldwork, !kung social groupings appear to have no continuity at all.

Enumerating social ties

Conversations

Preliminary work for the isolation of different reciprocal relationships and the development of a questionnaire about these was done by recording topics of conversation during August 1974. Every other day I visited a different camp at /xai/xai, interviewed about areas of landrights, and then remained in the camp sitting under a tree reading and writing while following the major conversations in the camp, under the pretext that I did not want to stay alone in my

camp to work. This excuse was most acceptable to the !kung who dread being alone, and after the first five minutes they ignored me. Visits to different camps were made at different times of the day and during the evening. Only conversations lasting for more than 15 or 20 minutes were systematically described by notes taken while the conversations took place or immediately after.

Table 1 lists the major topics of conversation during the month of August, a period not representative of normal !kung life. The

TABLE 1
Topics of conversation recorded in August 1974 among the !kung San at /xai/xai

	No*	%
Plans for purchasing food with cash from sale of handicrafts	7	9
Availability of food in other areas and visiting plans	7	9
Complaints about food sharing	7	9
Complaints about meat sharing	3	4
Hunting stories	4	5
Condition of the mongongo nut crop	3	4
Condition of other wild food crops	3	4
Drinking stories and discussion of money squandered on beer	11	14
Conversations levelling persons who were acting like "big shots" (4 centred on certain persons who were amassing livestock, personal possessions and hoarding food)	7	9
Sickness, medicine and trance curing (3 stressed necessity of additional food to put on a curing dance)	6	8
Adventure stories about travel to larger towns (3 stressed foods consumed on journey)	6	8
Well-digging	2	3
Horse and donkey riding	2	3
Personal gossip	2	3
Miscellaneous conversations (1 centred on landrights and access to food)	6	8
Total	76	100
Conversations about food, food procurement and sharing: (drinking not included)	45	59
Conversations in which food was a major concern:	31	41

* No = number of conversations on a topic which lasted for more than 15 minutes.

mongongo nut crop had failed, hunting and gathering were generally poor (Wiessner, 1977), and there was little water outside of permanent wells. The !kung were tied to permanent water, but without the staple crop which normally provides up to 80 percent of the diet at that time of year (Wilmsen, 1980). The !kung had cash from sale of crafts, but nothing to spend it on but Herero beer, as the nearest store with stocks was 75 km away at Tsumkwe.

Of the 76 conversations noted which lasted for more than 15 minutes, 59 percent concerned availability, procurement or redistribution of food. Due to the unusual absence of major bush foods in August 1974, discussion of the availability of domestic foods predominated. Of major concern was that domestic foods would have to be procured in bulk to make a trip to the store worthwhile, and that this would cause great conflict over redistribution. It might be added that earlier in the year, food conversations had not centred on domestic foods, but on the failure of the nut crop, problems involved in gathering in the unusually high grass, and the location of game.

The 41 percent of the conversations which did not involve food were particularly long, animated, entertaining and served to take people's minds off hunger and to relieve social tensions. Drinking stories and the pros and cons of drunkenness were the most popular topics of conversation. Other conversations involved stories of falling off horses and donkeys, trips to larger towns, experiences during trance and other miscellaneous topics such as different persons' skills in playing the thumb piano, interracial marriage, discussions of girlfriends, and so on. Conspicuously absent were conversations involving personal gossip. Provided that persons keep up their social obligations, the !kung are very discreet about others' personal lives.

Three types of reciprocity were frequently discussed during the conversations, *hxaro*, delayed, balanced gift-giving, food sharing and reciprocal extended visiting. *Hxaro* was never the central topic in the 78 discussions, but cropped up frequently when one person asked another who had given him a certain gift in *hxaro,* when one asked another to *hxaro* him something, etc. *Hxaro* gifts are given to specific partners, generally as a return for a previous gift, and considered the business of two partners and not a matter for public discussion, unless there is conflict between partners signaled by refusal to return a gift.

Two aspects of food sharing stood out in the conversations.

First, it was clear that persons had expectations of specific kin only. For example, in the two discussions of meat sharing, some !kung complained bitterly that they had not gotten a share or that their share was very small, while others who had not received a share remained quiet. Second, although the !kung had expectations of some persons and not others in food sharing, food sharing clearly did not have any set terms other than that the one who has little food can call on the one who has more for assistance. Unlike in discussions of *hxaro*, in food sharing, a great deal of time was spent in finding out who had what and did or did not give it to whom. Gossip played a strong role in regulating food sharing with its uncertain terms, while regulation was rarely necessary in the more balanced gift-giving involved in *hxaro*.

Discussion of visiting was generally spurred by the arrival of a person from another area or the return of residents. The !kung listened intently to accounts of the food situation in other areas, ignoring the ritual complaints about lack of food, and searching for subtle clues about whether or not food or water were in short supply. Here again specific families expressed interest in certain areas, while others did not as they had no close relatives in these areas. There was never any mention of balance in visiting nor complaints of certain people visiting too often, as visits were not made upon invitation but on the decision of the family who left on a visit.

The conversation data provided extremely valuable guidelines for formulating a standard set of questions about reciprocity. First of all, it made it possible to delimit three major types of reciprocity according to their frequency in discussions and the manner in which they were discussed. It also shed light on the interrelatedness of *hxaro*, food sharing and visiting. More importantly though, the conversations gave a good idea of the !kung view of various reciprocal relationships. On one hand, the !kung clearly expressed feelings of obligations to some and not to others, making it realistic to try to delimit a specific sphere of reciprocity for each person. On the other hand, it was evident that aside from a roughly balanced exchange of gifts in *hxaro*, the terms of reciprocal relationships were vague and that interviews should not centre on what a person had given to another and what he expected to get in return. This information was particularly important for working with the !kung who tend to answer questions with what they think one would like to hear.

Developing a questionnaire

To develop standard questions about *hxaro*, sharing and visiting, in depth interviews on these topics were carried out with four particularly articulate informants and supplemented with group discussions. *Hxaro* emerged as the formal exchange relationship which represented an underlying one involving rights to visit a camp and become integrated into the local sharing network, so I began with that.

Hxaro interviews

The !kung agreed that it would be possible for them to list their *hxaro* partners as these were firm, long-term relationships. Subsequently, the four informants mentioned above helped develop a list of questions which would elicit information about *hxaro*. The final "questionnaire" included the following items:

1) listing of each *hxaro* partner
2) partner's age
3) partner's sex
4) partner's abilities or principal way of making a living
5) partner's residence
6) partner's areas of landrights if different from residence
7) genealogical relationship of partner to ego
8) social kinship relationship of partner to ego
9) intensity of gift giving, food sharing and visiting between ego and his partner.

Since all non-food items are circulated as *hxaro* gifts, this information was subsequently cross-checked by taking each of a person's possessions, asking who gave it to them and collecting the above information on the giver. Of the 1483 possessions of the 59 adults interviewed, 69 percent were obtained from *hxaro* partners, 27 percent were bought or made, while only 4 percent were gifts from !kung who were not *hxaro* partners. The tally of possessions incited discussion of specific *hxaro* relationships and occasionally reminded persons of partners they had forgotten to mention.

A series of more abstract questions was interjected at appropriate times during the interviews, but quickly dropped if an informant appeared not to have anything to say. These included:

1) What is a *hxaro* relationship and what obligations does it involve?

2) What types of interaction had ego had with his partners over the past few years and what were his feelings about these relationships?

3) What obligations does a person feel towards other persons of various relationships to him who are not partners?

4) How, why and with whom are relationships initiated and discontinued?

5) What are the different words used for various types of giving and what do they imply?

6) How does a person assure that he or she will get a return?

7) What are the problems with having too many or too few partners?

8) As *hxaro* gifts pass through several hands in "chains" of gift giving, who are the other persons on a chain and does ego feel any obligations towards them?

In addition, any other leads given by informants were followed up. The !kung rarely gave general answers to these questions and so the information had to be obtained through refering to specific cases.

The sample

The above questions were asked to 81 !kung adults and children, and interviews with 59 adults are used in the following analysis. Of these, 34 were residents of three randomly chosen camps at /xai/xai, and the remaining 25 were partners of these persons who resided either at /xai/xai, Dobe, or Tsumkwe. Whenever a person was chosen, his spouse and family were also included in the sample. The resulting sample consists of 35 informants from /xai/xai, 6 from Dobe, and 18 from Tsumkwe.

Each !kung was paid with a gift agreed upon at the beginning of the *hxaro* discussion and given food for himself and family for the duration of the 1-3 day interview. The amount was fixed so that informants would not extend interviews to make more money. Before each interview, persons were asked if they felt like talking about *hxaro* that day, and if they did not, it was postponed until another day, something which happened fairly frequently. The !kung were very conscientious and often came by my camp days later to tell me about a partner they had fogotten to mention. The possession tally soon became a major source of entertainment in the community.

The *hxaro* interviews yielded two sets of data: 1) responses to questions 1-10 plus responses to the possession tally, and 2) discussion of the more abstract questions about *hxaro*. The former were coded and analyzed by computer, while the latter were listed under categories, with general opinions extracted and individual expectations noted. First, I will discuss the latter and then give summary data of the former.

Results

The 59 !kung interviewed expressed a wide variety of feelings about *hxaro*, but most agreed on the following points. The first was that *hxaro* involved a roughly balanced, delayed exchange of gifts, and that these gifts were kept for a few weeks to a few years and then passed on to others on a *hxaro* chain. All !kung agreed that one could visit a partner whenever one likes and expect to be welcomed and integrated into the local sharing system of the camp. Most !kung said that given a choice, they preferred to visit a partner when there was ample food in his camp, or at least more than in their own, although all !kung agreed that important social matters warranted a visit at any time. Numerous reasons were given for visiting including all of those mentioned in the quote from Lorna Marshall, as well as to get medicine, to look for a job, to drink milk, to eat maize meal, to rest, and to get more help from one's relatives. Many !kung looked forward to a visit as a change and holiday.

Questions about the relations of *hxaro* to food sharing drew a blank with most informants. They simply stated that they shared food within the camp and with close kinsmen in other camps. When asked more specifically about these kinsmen, they were usually *hxaro* partners. Within the camp, however, they said that food sharing occurred with partners and others alike as well as with anybody who came through at dinner time. The terms used for the exchange of gifts, *hxaro*, and for food sharing *n/aa* had different implications. The word *hxaro* implies that a return is expected, but the word *n/aa* simply means to give and carries no obligations for specific returns.

Although !kung expect a rather balanced exchange of gifts in *hxaro*, no !kung could specify any other specific terms except that one is said to "*//rai*", to hold or have responsibility for that person. They did say, however, that if they asked a partner for something and kept asking that, eventually, it would be given. Somebody who was not a partner would not ask, or at least not in the same way. The terms of the relationship then appear to be what

Sahlins (1974) describes as generalized reciprocity — that he who has gives to he who is in need and vice versa. This form of reciprocity is well-suited to dealing with unpredictable events in the Kalahari.

Most !kung also felt some obligation to the person one step down a *hxaro* chain from his partner (Wiessner, 1977, 1980a) and a few !kung felt obligations to those two steps away as well. Such persons are usually parents, siblings, children or spouses of a *hxaro* partner. Informants stressed that *hxaro* formed links between groups of kin, as one participates in sharing with partners' kin during a visit and vice versa. Otherwise the !kung felt no specific obligations to relatives of a partner who did not live with him, nor to persons with whom they shared a common name, nor to their own more distant relatives with whom they did not carry out *hxaro*. No informant expressed concern with having to refuse to give to those with whom he or she had no specific obligations, saying that such persons would not ask. Degree of interaction with various partners varied greatly as did tolerance for imbalance in relationships, depending on the nature of the kin tie, the history of a relationship, the relative productive abilities of a partner, personality traits and so on.

Most partnerships were said to be either inherited or the outgrowth of a relationship developed during childhood with close kin (Wiessner, 1977, 1980a). Relationships were most frequently discontinued upon the death of a partner if both families made no effort to renew the tie. Others tapered off if both partners lost interest in the relationship and ceased visiting, while still others ended in serious conflict. Most !kung agreed that it was bad to have too many or too few partners, the former causing a person to be *g//akwe*, a poor person, and the latter leading to many squabbles over giving and sharing.

The question which the !kung enjoyed answering the most was that pertaining to how one asks for and assures return. Most !kung stressed that it was the responsibility of the one who had received something to make his partner want to reciprocate or at least to *do* so. The !kung gave many colourful descriptions of how one asks, demands, pleads and jokes one's way into getting something (Wiessner, 1980a). When these methods fail, then one resorts to gossip within ear shot of the debtor. No person felt that he had to ask permission for any other to visit a partner, nor did he ever feel that he was behind in producing or giving and could not ask for his

share of food when in need. If persons feel exploited by partners it is their priority to either cease producing for a short period and thus have nothing to give, to conceal what they do have, or to move away. The !kung call the process of regulating relationships "the business of *hxaro*", and of the 59 adults interviewed, only four carried on limited *hxaro* because they claimed not to like "the business of *hxaro*".

The set of questions about specific partnerships provided information of the characteristics and distribution of 955 *hxaro* partnerships, as well as data on the origin of 1483 possessions. Together they give a thorough description of the !kung *hxaro* system. The average !kung has 16 partnerships although the range for adults is 2-42. Number of *hxaro* partnerships gradually increases with age to peak among adults with mature children who are very active trying to help out their grandchildren and may be still trying to arrange marriages for their younger children (see Table 2). Number of partnerships decreases rapidly again when they enter old age and pass on partnerships to their children (Wiessner, 1977, 1980a). Number of other areas in which persons have partners varies from about one to four with most persons having partners in at least one area other than their own (see Table 2).

Ninety-one percent of the *hxaro* partners listed were said to be kindred members of direct descendants, while only 9 percent were specified as friends or affinal relatives. However, a person always

TABLE 2
Number of hxaro partners and areas of hxaro* ties by age category for 73 !kung San

Age category	n	Hxaro partners x	Hxaro partners sd.	Areas of hxaro x	Areas of hxaro sd.
Children	14	4	2	1.0	0.5
Adolescents and marriageable young adults	10	12	4	1.6	0.8
Adults with small or adolescent children	27	13	7	2.9	3.7
Adults with mature children	14	24	8	3.6	1.5
Old, partially dependent adults	8	12	6	2.3	1.0

* Areas are given in Table 6 and Map 1.

TABLE 3
Distribution of hxaro partnerships of 59 !kung by origin and kin relation (Total number of partnerships = 955)

Partnerships started during lifetime		Inherited partnerships			Total
Close relatives*	Friends and affines	Gt-grand-parents' descen-dants	Gt-gt-grand-parents' descen-dants**	Unknown	
7.4	1.4	2.5	1.5	3.2	16.0
46*	9%	16%	9%	20%	100%

* = parents, siblings, children, grandparents, parents' siblings, siblings' children, and parents' siblings' children, both half and full.
** = adequate genealogical data available for only 13 !kung.

does indirect *hxaro* with his spouse's family via his spouse. For kindred members, 36 percent were said to come from fathers' kindreds, 40 percent from mothers' and 24 percent were direct descendants. Most !kung chose partners equally from both kindreds with only 12 percent having more than 75 percent of their partners from their fathers' kindreds and 14 percent from their mothers' kindreds. As can be seen in Table 3, 78 percent of those said to be kindred relatives were indeed traceable despite the !kung's very shallow knowledge of genealogy. Persons to whom !kung were connected through the "name relationship" (Lee, 1972; Marshall, 1976) were not chosen more frequently in *hxaro* than those not sharing family names (Wiessner, 1980c). The name relationship does however facilitate visiting by allowing a person to classify strangers in a partner's area as kin, making interaction possible.

As mentioned earlier, *hxaro* partnerships can either be inherited or formed during a person's lifetime. Inherited partnerships are highly valued, secure and time-tried, allowing solutions to recurrent problems to be passed on to the next generation. They equalize the number of kin available to !kung despite their families' reproductive success by keeping relations with kin of past generations open. As can be seen in Table 4, persons currently having 0-10

close adult relatives are not at a disadvantage in *hxaro* compared to those having 11-20, as they make up for a shortage in kin by keeping more inherited partnerships active. Those with 20-40 close kin appear to have an advantage in *hxaro*, but when the age factor is controlled, this difference is not statistically significant (Wiessner, 1980c).

TABLE 4
Number of hxaro partnerships according to family size

Ego's number of close adult relatives*	n	Number of hxaro partners who are: Close relatives x	sd.	Friends/ affines x	sd.	Inherited partners x	sd.	Total x	sd.
0-10	17	4.4	1.9	1.2	0.9	8.0	6.2	13.6	7.0
11-20	25	6.9	2.5	1.2	1.5	5.7	5.6	13.8	6.7
20-40	13	9.9	3.0	1.6	1.7	9.6	6.8	21.1	9.0

* Close relatives include half and full parents, children, siblings, grandparents, parents, siblings, siblings' children, and parents' siblings' children.

Men and women participate equally in *hxaro* and their partnerships are distributed over others of all ages and both sexes (Wiessner, 1977, 1980a). Most !kung choose partners with very different ways of making a living — hunting and gathering, wage labour, agriculture, etc. — as can be seen in Table 5.

Table 6 gives distribution of *hxaro* partners in space. Partnerships with persons in a camp facilitate smooth sharing and alleviate jealousy. Those with partners in adjacent bands up to 30 km away allow for extended visits to be made to neighbouring groups or when the two bands are camped at /xai/xai, a person can give his partner a bag to fill with a specific vegetable food. *Hxaro* ties with partners living more than 50 km away are called on less frequently, every 2-7 years, for social and/or economic reasons. Of 170 partners located farther than 50 km from /xai/xai, 152 or 89 percent live where there is a steady supply of domestic foods.

TABLE 5
Distribution of hxaro partners according to ways of making a living

Ways of making a living of hxaro partner	Families interviewed					Total	Percent
	Adolescent female: Gatherer	Married couple—No children: Gatherers	Married couple w/ mature children: Hunters/ and gatherers/	Old married couple: Partially dependent	Married couple w/4 young children: Gatherers		
Wage laborer in Namibia	0	2	2	1	1	6	6
Employee in border camp	1	3	2	3	2	11	12
Subsistence laborer in Botswana	3	3	6	0	0	12	13
Hunter-bow & arrow and horseback	2	4	4	1	3	14	15
Trapper and/or gatherer	3	4	5	2	2	16	17
Adolescent	1	2	2	2	1	8	9
Old, partially dependent	2	4	9	5	3	23	25
Disabled	0	1	1	1	0	3	3
TOTAL	12	23	31	15	12	93	100

TABLE 6
Distribution of hxaro partners by area for /xai/xai !kung

Area	km from /xai/xai	Hxaro partners in area No.	%	Important resources of area
Own camp	—	91	18	—
/xai/xai area	5-25	123	24	Hunting, gathering, subsistence labor, possibility to market handicrafts
Nyae Nyae-due areas	10-40	44	9	Hunting, gathering, wage labor, steady supply of meal and sugar to workers, transport to points West
N/umsi area	30-40	82	16	Hunting, gathering, store (rarely stocked), school seat of local government, wage labor (cattle trekking), subsistence labor, transport to points East
/gam area	50+	17	3	Hunting, gathering, some wage labor?, transport to points West?
Tsumkwe area	75	102	21	Clinic, store, school, agricultural projects, wage labor (50-80), assistance for sick and old, handicraft market
Nxau Nxau area	100+	1	0(.002)	Hunting, gathering, subsistence labor
Farms in Namibia	150+	12	2	Wage labor, subsistence labor, store, clinic, school?, transport
Sehitwa farms	150+	26	5	Store, school, clinic, wage labor, subsistence labor w.good returns, transport
Ghanzi farms	190+	12	2	Store, school, clinic, subsistence and wage labor
Total		510	100	

prevents large quantities of food from spoiling and strengthens social bonds. However, because it depends on a condition and not on specific sharing relationships, its impact can only be measured in a nutritional study by making the distinction between animals killed and meat consumed, a job which is both delicate and tedious.

Hxaro

From the interview data, *hxaro* relationships were seen as delayed exchanges of gifts marking an underlying relationship of mutual access to goods and resources (Wiessner, 1977, 1980a). To obtain an idea of the importance of the underlying relationship, *hxaro* partnerships were correlated with visiting patterns. Data on visiting was available for two complete years — that collected by Richard Lee in 1968-1969 and that collected by myself in 1974. Visiting patterns for 20 randomly selected adult individuals who were present in both years were compared to data on distribution of *hxaro* partnerships.

Together these persons made 86 visits of more than a week to persons living outside of their area of landrights or that of their spouse. In most cases, the person was accompanied by his or her nuclear family. Eighty out of 86 visits (93 percent) were made to a camp where the person had at least one *hxaro* partner. Of the remaining 6, 4 were visits made to areas where a person had no partners while on his way home from a wage labour job. These visits, however, have their cost, with most workers giving or drinking away most of their wages to come home almost empty-handed (Lee, 1979). The average !kung family then made 1.5 visits a year to the camp of a *hxaro* partner with a mean duration of 2.2 months per visit and a range of 1 week (by definition) to 10 months. In addition visits of several hours to nearby camps are daily events. This means that for approximately 3 months a year, a family lives off resources other than those of their own camp or band.

These data provided two important guidelines for investigating the impact of *hxaro* ties on diet. First of all the data strongly suggest that visits are not made on an ad hoc basis, but are restricted to 1-3 areas in which the average family has *hxaro* ties. Consequently sampling of resources available in these areas and subsistence income derived from these resources compared to the same in a family's own area could give a good measure of the value of social ties. This task would be much more complex if visits could be made on

an ad hoc basis to any area. Secondly, the data show that there are two kinds of visits, those which last for a few hours to a few days, during which little or no subsistence work is done, and those which last for several weeks or months, during which families hunt and gather their own living. Consequently, a different sampling strategy would be necessary for short and long term visits.

To obtain some estimate of the impact of visiting on diet, visiting patterns in a very good and very bad year were compared and then visiting rates in different months were examined. As can be seen in Table 7, visiting patterns in 1968, which was an excellent year, were very different from those in 1974, a very poor year, particularly locally. In 1968, more than half of the visits were to adjacent bush camps for social purposes and to take advantage of certain bumper wild food crops in local areas, while in 1974, the vast majority of visits were to partners more than 30 km away, who did not experience the same food shortages.

TABLE 7
Visiting patterns* of 20 !kung in 1968 and 1974

Visits to	1968		1974	
	n	%	n	%
Adjacent areas**	25	55	6	15
Distant areas	20	45	35	85
Total	45	100	41	100

* Visits listed here include only visits lasting more than a week to an area in which neither a person nor his spouse has landrights. 1968 was an excellent year and 1974 a very poor one locally.

** Adjacent areas are less than 30 km from /xai/xai. Distant areas are between 30 and 200 km from /xai/xai.

Data on rate of visiting in various months, however, supports the claim made by the !kung that visits can serve many purposes. As can be seen in Table 8, visiting does occur all year round, although it peaks during the leanest months. In 1974, the highest rate of visiting occurred in August, a month in which dependence on

TABLE 8
Number of /xai/xai residents* away visiting during 1974 by month, n = 142**

J	F	M	A	M	J	J	A	S	O	N	D
31	31	35	40	42	41	44	67	55	55	55	53

* Residents were defined as persons who have lived at /xai/xai since 1969.
** For comparison with Wilmsen's data (1980) it should be noted that in 1974 the mongongo nut crop was very poor with virtually no nuts in /xai/xai groves after May/June.

mongongo nuts is heavy, 70-80 percent of the diet (Wilmsen, 1980). Without mongongo nuts, there was little food at /xai/xai and almost half of the residents left to seek complimentary resources in other areas and to take pressure off of the existing ones at /xai/xai — 80 percent of visits made were to areas where the visitors could and did live off of domestic foods.[3] Both Lee (1979) and Marshall (1976) give numerous examples of visits made to exploit resources not available in a group's own area.

The high rate of year-round visiting, however, implies that social factors must be taken into account by comparing the timing of visits with severe conflicts within a camp, as well as the correlation between major demographic events, particularly marriage, and visits to certain areas. This work is now in progress and should give a much better idea of the relative importance of social and environmental factors as incentives for visits.

A final factor which must be considered is whether ties of reciprocity serve similar purposes for most individuals, to open up access to the resources of other kin groups as the !kung claim, or whether it is used by some to provide basic security and by others to amass wealth, prestige or influence. To do this, the important economic skills of 17 men at /xai/xai who were both in my sample and in Wilmsen's were correlated with number of *hxaro* partners and number of gifts received per *hxaro* partner. The results are given in Tables 9 and 10. The data on hunting success for a 19 month period was generously provided by Ed Wilmsen.[4] Data on other subsistence persuits were summarized from my study and Wilmsen's on ways of making a living used by each individual between 1973-75. Men also participate in gathering to provide about 20 percent of gathered food (Lee, 1979), but data on amount of food gathered by individual men is not available.

Table 9 shows the great variation which exists between men in number of *hxaro* partners according to economic skills. For example, two unusually able individuals, Tsao (512-241) and ≠ toma (324-721), have similar skills and yet one has 26 more partners than the other. This difference can be largely attributed to personality, Tsao preferring to have more superficial ties with many persons and ≠ toma preferring to have fewer but more intense ones. ≠ toma's strategy is considered more sound by most !kung. For those with fewer abilities, a similar contrast can be found such as that between /twi (405-331) and /xashe (553-351). Note also that the man elected village chairman, Tsao (521-931), is very able and popular, but carries on *hxaro* with a slight lower than average number of partners.

The summary of the above data as presented in Table 10 does show a trend for those having skills which lead them to associate with a broader range of persons — big game hunters, wage labourers, and trance healers — to have more *hxaro* partners. However, Fisher's exact tests run on all variables shown in Table 10 indicate that these tendencies are not statistically significant at the 0.05 level. Because individuals often switch ways of making a living, average number of gifts received per *hxaro* partner was compared to each economic activity to see if those who were currently more active were also receiving more gifts. Here again, no statistically significant trends were found.

Although similar data needs to be analyzed for women, the above results strongly suggest that although some !kung are more active both economically and socially than others, that most !kung can be considered to engage in sharing and *hxaro* for similar reasons, to gain access to the resources and assistance of others thereby assuring themselves a steady subsistence income. These findings are consistent with views expressed in the literature on the !kung (Lee 1979, Lee and DeVore (eds), 1976, Marshall 1976). They also indicate a random sample of families' *hxaro* ties in a nutritional study will represent the population as a whole, and it will not be necessary to stratify the sample according to radically different uses of *hxaro* by different segments of the population.

TABLE 9
Number of hxaro partners and hxaro gifts per partner for 17 men at /xai/xai according to economic skills

Name	Age	I.D.#	Hunting success (weight in kg)			Labour		Trance	Is	# hp	±	Gifts /hp
			50+	12-50	Birds	Subs	Wage					
Kram/o	3	641-221	3	6	50		X			22	+9	1.1
Tsao	4	512-241	4	1	41			X	X	42	+18	0.6
/Xashe	3	572-731	10	15	30					13	+0	0.6
≠Toma	4	324-721	6	17	1			X		16	−8	0.8
N≠eishi	3	536-321	4	4	16	X	X		X	9	−4	1.7
Tsao*	2-3	427-571	3	2	4	X	X		X	20	+4	0.7
N//ao**	3	643-951	1	1	0		X	X	X	19	+4	1.1
G/unta	3	334-741	1	8	1					11	−2	1.1
Tsao (C)	4	521-931	1	0	0				X	19	−5	0.9
≠Toma**	4-5	423-511	0	5	19	X		X		21	+2	1.8
/Xashe	3-4	422-521	0	6	55	X				8	−10	1.5
/Twi	3	405-331	0	2	73		X			5	−8	0.4
/Xashe	3-4	553-351	0	3	35		X			18	+0	0.7
Dam	5	429-341	0	0	0	X				7	−5	1.0
N//ao (B)	3	367-761	0	0	0				X	10	−3	1.7
/Ti/tay	3-4	414-111	0	46	59	X				12	−6	—
≠Toma (PB)	5	511-711	0	7	13					11	−1	1.5

* = Unmarried B = Blind C = Village chairman
** = Two wives PB = Partially blind

1) I.D.# = Harvard Project's identification number — Ed Wilmsen's I.D.#.
2) Age category = 2 = adolescent; 3 = adult with small or adolescent children; 4 = adults with mature children; 5 = old, partially dependent adults.
3) Hunting success = number of animals of various weights killed during a 19 month period.
4) Labour = subs: subsistence labour at /xai/xai with Herero or recipient of periodic gifts of milk and meal from Herero as recognition that 423, 429 and 414 were original owners of the land.
wage: periodic wage labour away from /xai/xai.
5) Trance = active trance healer.
6) Is = owner of productive livestock: cattle, horses for hunting, or goat herds.
7) # hp = number of *hxaro* partners; ± = number above or below mean for age category.
8) Gifts/hp = average number of gifts received per *hxaro* partner.

TABLE 10
Summary of number of hxaro partners and number of gifts per partner by economic activity for 17 men at /xai/xai

Activity	# hp+ / # act	# hp+ / # not	# 1+ gifts / # act	# 1+ gifts / # not
Hunting:				
50-1000 kg game (one or more animals killed)	5/9	2/8	4/9	5/7
2-50 kg game (5 or more animals killed)	3/7	4/10	5/7	4/9
Birds (more than 10 birds killed)	5/10	2/7	5/9	2/7
Wage labour	4/6	3/11	3/6	6/10
Subsistence labour	2/7	5/10	4/5	5/11
Trance healing	3/4	4/13	2/4	7/12
Livestock ownership	3/6	4/11	3/6	6/10

hp+/# act = number of persons with average or more than average number of *hxaro* partners / number participating in economic activity.
not = number of persons not participating in activity.
1+gifts/# act = number of persons having more than one gift per *hxaro* partner / number participating in economic activity.
not = number of persons not participating in activity.

Discussion

The data necessary for verifying the role of *hxaro* ties and frequency of use was relatively straightforward to collect in comparison with that on different types of reciprocal relationships, their terms, and distribution. At this stage, data can often be collected by either a trained literate or even an illiterate local informant. Data on visiting while I was absent were collected by both and their reports coincided well. The use of community residents to collect data can be particularly valuable for events which occur at intervals longer than the average period of fieldwork.

Measuring the impact of *hxaro* on diet

The above data suggest that reciprocal relations among the !kung do have a critical impact on diet, although their precise role is unclear. At this point, gathering additional indirect evidence will be of little help. Rather the data on sharing and *hxaro* must be included directly in the research design of a nutritional study, so that their effects can be measured directly.

The last step of the study, an attempt to do this, is now in progress through correlation of the data on *hxaro* with Wilmsen's data on subsistence income. The ideal procedure would have been to include visits into the original sampling strategy, so that subsistence income in a person's camp could be compared with that of the camp visited. However, several factors made this unfeasible. First of all, the two studies were carried out simultaneously, so that the results of my study were not processed until Wilmsen's 1975-76 phase was finished. Subsequently, change in the /xai/xai area occurred so quickly after 1976 with the drilling of a borehole, the building of a school, and institution of numerous food and agricultural programmes, that when I returned in 1977, it was no longer possible to do such a study. In 1979 when Ed Wilmsen returned, most of these programmes were still going, and during the drought in the spring of 1979, all residents received more than ample famine relief supplements (Wilmsen, 1980), alleviating the need to visit other areas.

Nonetheless, much can be done with the data from 1973-76. As Wilmsen's data covers subsistence income of all /xai/xai residents the two data sets can be correlated to see: 1) what is the range of variation in resources available to each band at /xai/xai and to what extent the resources of bands complement each other, 2) if and how this complementarity of resources is correlated with distribution of ties, 3) whether or not individuals obtained resources from those in other bands, and if so were these persons *hxaro partners*, 4) when bands are located out in the bush surrounding /xai/xai, to compare the resources available in a family's camp with those available in surrounding camps visited, and 5) to look at the economic abilities of a person's partners in the /xai/xai area and see how they complement his or her skills.

In doing this, particular attention will be paid to the effect of persons' sets of partnerships as a whole on their subsistence income, for there is a good possibility that a wide network of local

hxaro ties can lower a family's subsistence income. Families with extensive local ties tend to spend many months at /xai/xai, always hoping to scrape by with assistance from partners, causing longer periods of aggregation than may be optimal. Those with fewer ties spend more time in the bush and may bring in a higher subsistence income. Thus, the subsistence income of bands or families with many and few local ties must be compared.

Impact of visits to *hxaro* partners in more distant areas will have to be estimated rather than directly measured. Since more distant visits were made to !kung who have a regular supply of maize meal, sugar and often milk, supplemented by hunting and gathering, subsistence income at these places can be estimated to approximate that at /xai/xai during the famine relief programme at /xai/xai as recorded by Wilmsen (1980). Weights of individuals before and after visits to specific places can also be compared. Additional information can be obtained by looking at the time of year /xai/xai was visited by the 24 persons in the sample living elsewhere, as well as subsistence income in the camp visited, if a person had partners in numerous camps.

The compilation of accurate data on subsistence income derived from hunting and gathering and on the role of social ties in obtaining this income is now of particular importance. Recently a number of events have occurred in the /xai/xai area which threaten the hunting-gathering way of life — the institution of supplementary food programmes and the possibility that as political tensions increase the Botswana-Namibia border will be closed to !kung who now cross freely. Both of these events could have the result that high quality diet is replaced by one of largely maize meal and sugar at considerable cost, and that a previously self-sufficent population becomes dependent on government handouts. In addition, with the breakdown of internal dependencies can come problems with the equitable distribution of assistance.[5]

Conclusion

The !kung system of placing ties of mutual reciprocity to allow for extensive visiting and mutual food sharing is by no means unique. Similar systems have been reported for the G/wi San of the Central Kalahari Game Reserve (Silberbauer, 1972), the Nharo San of the Ghanzi farm area (Barnard, 1979), the !xo San of the south western

and central Kalahari (Heinz, 1979), and the G//ana San of the central Kalahari (Cashdan, 1980), although each is based on different ties — kinship, marriage, gift-giving, band alliances, ritual events, etc. Pastoralists and agriculturalists in Botswana too have ways of distributing persons according to where they are most needed and can be best provided for (Schapera 1940).

Each of these social relationships represents one of many systems used by people all over the world to obtain a higher subsistence income with as little as possible variance or risk associated with it. There are few, if any families who can secure themselves against all losses by control of the environment and storage alone, and most must at some time fall back on others with whom they have appropriate ties. As Sahlins puts it, "Almost every family living solely by its own means sooner or later discovers it has not the means to live" (Sahlins, 1974, p.101). These ties can cover a wide variety of events, and, although they will all either directly or indirectly affect diet, will do so with very different degrees of importance, and may be either difficult or easy to replace. For this reason it is essential to get accurate measurements of the role of social ties and their extent of impact on the standard of living, something which is traditionally considered extremely difficult to do.

I think that the !kung data yields some positive results concerning these problems, particularly since hunter-gatherer reciprocity is renowned for being ad hoc and having extremely vague terms (Meillassoux, 1973; Lee and DeVore (eds.), 1968; Woodburn, 1980). This study in no way changes the view that the terms of hunter-gatherer reciprocity are vague, and the purposes multiple and difficult to sort out. The results do, however, suggest that it is either possible to specify a set of conditions under which reciprocal relationship occur or to enumerate the major social ties of each individual and to collect systematic data about their characteristics and distribution. I would be surprised if similar work were not possible in most societies, because in order for social ties to cover losses, a person must be able to plan and place his reciprocal relationships. If they do so, they should also be able to specify these persons or conditions when appropriate questions are asked.

Once a person's or family's ties have been enumerated, the data can be incorporated within the research design of a nutritional study and their effect measured. Undoubtedly, many facets of these social ties will be overlooked, those which add to quality of life, but are intangible. But, those which can be measured, such as

effect on diet, will fortunately be the ones which are of concern to development planners. They will only be of concern, however, if their impact is measured in a way that the cost of replacing them can be made clear, something that should be possible if the same amount of effort is put into enumerating social ties as into measuring subsistence income and energy expenditure. Hopefully the results of the final stage of this project will provide encouraging results in this respect.

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Notes

1. The use of the name !kung San and spellings of all !kung place names and words follows the system adopted by the Harvard Project. In other publications, the !kung San are called the !kung Bushmen (Marshall, 1976), the ǂu/ðasi (Wilmsen, 1978, 1980) or the Barsarwa (all Botswana Government publications). /xai/xai appears in other publications as /ai/ai (Wilmsen, 1978) and KaiKai (Marshall, 1976).

2. As no complete survey of the entire central !kung area has been made, this map gives an approximate rather than a precise or complete summary of distribution of resources.

3. All of these areas were visited in 1974 between July and November to see what /xai/xai visitors were eating.

4. Animals hunted were divided into three categories — birds, animals weighing between 2-50 kg and animals weighing between 200 and 1000 kg. For the latter two categories, all species but two, warthog and aardwark, weighed either below 20 kg or above 200 kg according to average weights given in Lee (1979). Aardwark weighed between 40-60 kg and were included under small/medium animals and warthog between 70 and 80 kg and were included under large animals. There were only two warthog and one aardwark in the sample.

5. This in fact has not yet happened. *Hxaro* and food sharing appear to be more robust than hunting and gathering in the face of change. !kung willingly give up full-time hunting and gathering to live off wage labour, subsistence labour, agriculture or handouts and find it difficult to readjust to the hunting-gathering way of life with few possessions, high mobility and diet lacking bulky maize meal. In contrast, *hxaro* and sharing flourish despite changes in the economic base, because modern options

do not provide full security for the !kung. In the three areas of change studied, on the Ghanzi farms *hxaro* was active to allow !kung to change farms, when farmers periodically expelled all San who were not employed, as well as to allow families to seasonally return to bush areas to hunt and gather. On the settlement scheme at Tsumkwe, *hxaro* was used to permit !kung to take turns filling the limited number of jobs available, redistributing their income to feed and clothe many relatives, and then quit work to let others take up their jobs and in turn support them. *Hxaro* ties with !kung in Botswana also permit families to leave Tsumkwe to "rest" from work and only the few !kung who had been "adopted" into Tswana or Herero compounds as permanent workers completely dropped *hxaro* ties, while others used ties in a similar way to the Ghanzi and Tsumkwe !kung. *Hxaro* ties do much to preserve !kung independence and freedom, allowing them to combine many ways of making a living and giving them the option to drop employment which is tedious and underpaid after they have done their share.

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Sal Restivo

Mathematics and the limits of the sociology of knowledge

The problem of the limits of the sociology of knowledge arises in its most acute form when considering whether and to what extent mathematical knowledge is a social fact. Some sociologists of knowledge deny the *possibility* of a sociology of mathematical knowledge. Mannheim (1936, p.79), for example, writes:

> Even a god could not formulate a proposition on historical subjects like 2x2 = 4, for what is intelligible in history can be formulated only with reference to problems and conceptual constructions which themselves arise in the flux of historical experience.

Similarly, Stark (1958, p.162) writes: "Surely, there can only be one science of numbers, forever self-identical in its content." Spengler (1926, pp.59-60), by contrast, not only affirms the *possibility* of a sociology of mathematical knowledge but defends the *extreme* position that (1) "*there is not, and cannot be, number as such*. There are several number-worlds as there are several cultures"; and (2) "There is not mathematic, but only mathematics".

This paper is based on the assumption that the *possibility* of a sociology of mathematical knowledge has been demonstrated by

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